

In the matter of

**WIRELESS TELECOMMUNICATIONS BUREAU AND OFFICE OF
ENGINEERING
AND TECHNOLOGY SEEK COMMENT ON NEXTNAV PETITION FOR
RULEMAKING WT Docket No. 24-240, RM-11989**

Overview

VIAVI Solutions, Inc wishes to comment on the above matter with respect to the petition by NextNAV, Inc. to change the allocations for the 902-928 MHz band for the purpose of providing terrestrial Positioning, Navigation and Timing (PNT) services as a resilient alternative to, and enhancement to the PNT service provided by the Global Positioning System (GPS) satellite constellation. VIAVI supports the concept of Terrestrial PNT (TPNT) but questions the effectiveness and potential repercussions of this particular approach.

VIAVI is experienced in the cellular wireless testing and performance management market, the PNT product and testing market including alternative non-GNSS based PNT products and services, and in other aspects of the telecommunications business, including radio and avionics testing and the electronic warfare/electronic countermeasures business.

VIAVI has many customers in the cellular wireless and other segments of the telecommunications business. VIAVI tools and intelligence help Service Providers, Network Equipment Manufacturers (NEMs), and IT organizations build, test, certify, monitor, secure, maintain, optimize, and troubleshoot complex physical and virtual networks. VIAVI is also a global leader in advanced thin film coatings, enabling precision optical products including security pigments, light shaping optics, and custom filter technology for commercial and government customers worldwide. The broad scope of VIAVI's experience is being provided for context of its comments.

Technical Concerns and Alternatives

Besides a number of technical and resource issues associated with the disruptive nature of this proposal to the incumbent users, VIAVI's view is that Terrestrial Positioning, Timing and Timing (TPNT) and PNT in general can be better achieved by incorporating precision timing and geolocation signals within the existing cellular signal bands. The multiband nature of cellular networks provides an inherently more resilient platform for precision TPNT through frequency diversity. By having each cellular wireless sector transmitter include a timing element, multiple alternatives for PNT signal sources would be available which would overcome coverage issues from signal attenuation and deliberate or inadvertent jamming. Further, these signals should include an authentication element to guard against spoofing. Just as GPS receivers in wireless devices have an "almanac" of GPS satellite

orbital characteristics, these wireless devices could be provided with an almanac of cellular wireless sector sites' geolocation characteristics which could be used in a like manner to process the timing signals from these transmitters to calculate the position of the wireless device. We further propose that the wireless networks provide robust and accurate timing references with sufficient density to allow them to continue to operate even when GPS or precision network timing over fiber are unavailable.

NextNav's proposed solution of a 918-928 MHz carrier with a 902-907 MHz uplink is inherently as jammable as that of a GPS satellite constellation and therefore is not as robust as is required. Further, NextNAV's proposed system is dependent on the use of GPS which is inherently vulnerable to being unavailable due to the environment or denied due to interference.

While the use of the cellular wireless network provides a more layered and more resilient approach to TPNT to that of NextNAV, we further propose going beyond using the cellular wireless network in order to provide enhanced coverage and economical options that could be implemented over time and with evolving budget allocations. These options are detailed below:

1. Wide area augmentation of TPNT could come from employing elements of a TPNT system in FM radio and television broadcast signals. While these signals from broadcast transmitters may not be received by end user wireless devices, they may be used by other devices and by other networks as a reference signal source to be used as an alternative to GPS.
2. Indoor geolocation strategies could include the provisioning of precision TPNT systems embedded in a mandated indoor communications infrastructure. Public or private cellular wireless, Wi-Fi, LoRa, BlueTooth, ZigBee and other RF or optical systems could be enhanced over time to provide TPNT services as part of their capabilities. These could be implemented on campuses and in government buildings, schools, community institutions, enterprises and other areas of public assembly or transit. Wireless user devices could leverage these enhanced systems for a layered and resilient PNT strategy.

Some hotels are required by state or local ordinance to provide their staff with wireless communications systems incorporating precision geolocation down to a specific room. A variety of technologies are used to provide these interior structural geolocation capabilities, but they should be considered as part of a layered and resilient PNT strategy.

3. Finally, alternative sources of satellite PNT should not be overlooked for the provisioning of accurate and authenticated system timing and geolocation. VIAVI Solutions and other companies have introduced such systems and are continuing to evolve them. For areas where GPS, fiber, commercial broadcast, peer radio and other timing sources are unavailable or cannot be trusted, services such as what VIAVI offers can take an alternative timing and geolocation source and transcode it to provide a GPS signal in a hardwired interface to GPS-dependent devices. The use of a transcoded signal can be further enhanced through a set of authentication techniques designed to prevent spoofing.

By incorporating these and potentially other technologies into a cellular wireless or other devices the quality TPNT capability for the public and the enterprise for first responders would be enhanced. Each approach detailed above comes at a cost, but together they provide a resilient and cost-effective set of TPNT “fabric” elements that improve the geolocation resolution of today’s communications systems.

Other Concerns Related to the NextNav Petition

The NextNAV proposal has other impacts that are not adequately addressed in their petition, which are technical, societal, and practical.

Today, there are a large number of incumbent users that would be compressed into an 11 MHz wide space from 907-918 MHz that would likely suffer interference from the 1,000-2,000 Watt Effective Radiated Power signals from the NextNav system. Further, interference would emerge from devices whose services were relocated within a compressed band. Here are some statistics regarding the incumbent user population.

1. There are about one-hundred and fifty million (150,000,000) toll tracking transponders in vehicles.
2. There are many more than twenty thousand (20,000) toll monitoring device transmitter-receivers on our nation’s highways.
3. As of 2022, there were over 86 million smart water meters measuring consumption.
4. As of 2023, there were over 131 million electric and gas meters providing precision consumption and pricing. Further, many of these systems provide essential access to device control capabilities for appliances and HVAC systems for periods of peak demand to protect the power distribution network.

5. There are many wireless remote control systems including SCADA, which are used for access control and monitoring of critical infrastructure and enterprise security.
6. In 2021 there were 178 million LoRa devices globally and a substantial number were operated in the United States where they provide essential device integration and connectivity. These systems which operate in the 902-928 MHz band would need to relocate into the compressed band with the aforementioned congestion issues. Again, most users of these devices do not understand radio communications and simply deploy devices as “plug and play” systems. Their functionality would likely be impacted.
7. Along with the devices referenced above, there are hundreds of millions of other consumer devices of all types that will either be suddenly illegal and/or find themselves with an apparently and inexplicably dysfunctional operational state. This will cause economic hardship for those who are often least prepared to identify, understand or address the problems caused by the changes to the spectrum. Identifying who is impacted would be almost impossible especially if there was an opportunity window within which replacement devices could be provided.
8. In its communications research activities with partner universities with experimental licenses, VIAVI has been able to conduct experiments in the 902-928 MHz band that would otherwise not be possible. Even though the experimental licenses cover access to cellular wireless bands, they were too densely occupied to be of use. The low-power nature of most of the users of this spectrum provided research space in the spectrum for short-term academic research of commercial value. The band’s spectral nearness to the 600, 700, and 800 MHz cellular wireless bands provides for similar propagation characteristics for our experiments. The loss of such a band would greatly impact future research and the evolution of future services.
9. VIAVI and other technology companies have found a serious lack of available and capable talent with hands-on experience with radio communications. Our employees at every role from manufacturing, to engineering, to field operations to research scientists who are Amateur Radio operators with experience with these and other frequencies throughout the spectrum bring insights that those without their experience lack. The loss of the secondary Amateur Radio allocation in the 902-928 MHz band would be concerning, as would the loss of other

spectral adjacencies of other Amateur Radio bands near other commercial bands.

10. This band can be used by HAPS devices deployed in times of extreme emergency to provide cellular services on a contingency basis. For example, after Hurricane Maria devastated Puerto Rico, Google's Project Loon balloons with on-board eNodeBs provided cellular services in remote areas of the island for weeks until basic terrestrial coverage could be reestablished. iPhones and Samsung Android phones were provided updates that enabled their access to this band during the recovery period and this saved lives. With terrestrial PNT in the band, this would not be possible.
11. In times of emergency or for specific military purposes, the military is able to restrict or rapidly clear and shut down some of the incumbent users including Amateur Radio, and then effectively use the spectrum despite the presence of Part 15 devices. If this petition is granted, spectral clearance of infrastructure terrestrial PNT would not be an option for the military.
12. Wind profiler radar systems used for flight safety assurance operations would also be impacted by the presence of more users of all types in the compressed band. The effectiveness of these wind profiler radars will likely be compromised and potentially have an impact to safety of air flight operations.

Conclusion

In conclusion, we support the idea of a terrestrial Positioning, Navigation and Timing system, but feel that the NextNAV petition, while well-intended, is misplaced and insufficiently resilient and robust. Further, its technical, societal, and practical impacts are immense and should deter the Commission from granting NextNAV's petition.

Very respectfully,

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